

REMARKS

Claims 13-25 have been examined. Claims 13, 16 and 20 have been rejected under 35 U.S.C. § 102(b), and claims 14, 15, 19, 21 and 22 have been rejected under 35 U.S.C. § 103(a). Also, the Examiner has indicated that claims 17, 18 and 23-25 contain allowable subject matter. By this Amendment, Applicant has canceled non-elected claims 1-12.

Preliminary Matters

The proposed drawing corrections filed on May 13, 2003 have been approved by the Examiner. Accordingly, Applicant is submitting substitute formal drawings with this Amendment, and respectfully requests the Examiner to acknowledge the drawings.

In addition, as stated above, Applicant has canceled non-elected claims 1-12.

Rejections under 35 U.S.C. § 102(b)

The Examiner has rejected claims 13, 16 and 20 under 35 U.S.C. § 102(b) as being anticipated by JP 2000-062335 to Suda (“Suda”).

Regarding claim 13, the Examiner maintains that the recitation in claim 13 of heating “during” light irradiation does not differentiate the claimed structure from that of Suda. However, claim 13 recites a “means for” heating during irradiation and heat activation. The means-plus-function limitation requires the Examiner to give patentable weight to the function of the recitation (See 35 U.S.C. § 112, sixth paragraph, and MPEP § 2184). Applicant submits that

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the heating of the original plate during irradiation of the activation light, is clearly part of the function of the heating means. During a telephone conversation with the Examiner on September 22, 2003, the undersigned attorney discussed the “means” limitation of claim 13. The Examiner indicated that by invoking 35 U.S.C. § 112, sixth paragraph in this Amendment, he would reexamine the “means” limitation of claim 13.

Accordingly, in view of 35 U.S.C. § 112, sixth paragraph, the Examiner must show that heat section 17 of Suda performs the identical function specified by claim 13 (MPEP § 2184).

Applicant submits that dryer 17 of Suda fails to perform the identical function recited in claim 13. In particular, as stated in Applicant’s previous Amendment of February 13, 2003, Suda fails to disclose that dryer 17 is activated during activation of write-in equipment 15. Rather, as disclosed, dryer 17 is activated prior to write-in equipment 15. For example, as stated in paragraph [0049] of Suda, after “hydrophobing” processing liquid is applied to the plate by coating equipment 12, the dryer 17 is activated to dry the “hydrophobing” processing liquid (Fig. 6). Then, after the liquid is dried, a picture is written on the plate by ultraviolet rays emitted by write-in equipment 15 (para. [0049]). The fact that dryer 17 is not activated during activation of write-in equipment 15 is further demonstrated by Fig. 6, which depicts dryer 17 at a location which is distant from or almost opposite of write-in equipment 15 in a rotating direction of drum 11 (Fig. 6).

Accordingly, Applicant submits that claim 13 is patentable over the cited reference, and respectfully requests the Examiner to withdraw the rejection. Please note, Applicant has

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provided the Examiner with a computer translated version of the Suda reference with this Amendment, for the Examiner's reference.

Regarding claims 16 and 20, since such claims are dependent upon claim 13, Applicant submits that they are patentable at least by virtue of their dependency.

Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected claims 14, 15, 19, 21 and 22 as being unpatentable over Suda in view of U.S. Patent No. 6,048,654 to Nakayama et al. ("Nakayama"). However, since claims 14, 15, 19, 21 and 22 are dependent, either directly or indirectly, on claim 13, and Nakayama fails to cure the deficient teachings of Suda, Applicant submits that such claims are patentable at least by virtue of their dependency.

Allowable Subject Matter

As stated previously, the Examiner has indicated that 17, 18 and 23-25 contain allowable subject matter.

Conclusion

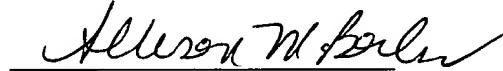
In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

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Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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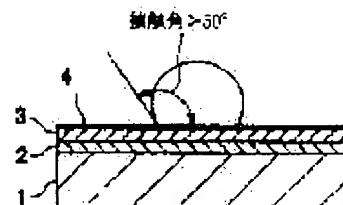
(21)Application number : 10-229110 (71)Applicant : MITSUBISHI HEAVY IND LTD
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(54) PRINTING PLATE MATERIAL AND RECLAMING METHOD THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To digitize a printing process and make the reuse of a material possible by a method wherein a coating layer including a titanium oxide photocatalyst is formed on the surface of a base material and a painting layer made of a compound, which can be dissolved through the irradiation of the light having an energy higher than the band gap energy of the titanium oxide photocatalyst, is equipped on the coating layer.

SOLUTION: On the surface of a base material 1, a coating layer 3 including a titanium oxide photocatalyst is formed. A painting layer 4 made of a compound, which can be decomposed through the irradiation of the light with the wavelength having an energy higher than the band gap energy of the titanium oxide photocatalyst, is formed on the coating layer 3. At the production of a printing plate material, at the early state, the surface of the coating layer 3 is prepared so as to be hydrophobic. By irradiating ultraviolet rays based on the digital data on an image over the resultant surface of the coating layer 3, the surface of the coating layer 3 is converted to be hydrophilic. Since writing of the image is directly executed with a light as mentioned above, the digitization of the printing plate material can be coped with. Further, since the converting properties of the titanium oxide photocatalyst from its hydrophobic properties to its hydrophilic properties, the reuse of the printing plate material can become possible.



LEGAL STATUS

[Date of request for examination] 06.06.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than

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3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the plate for printing, and its reproduction method.

[0002]

[Description of the Prior Art] Digitization of presswork is advancing as general printing technology these days. This is the attempt which is going to produce a version by digital-data-izing and using this data as it is by minding the image data read with the scanner etc. for a personal computer etc. While being able to attain laborsaving of printing work by this, it also becomes possible to perform high definition printing.

[0003] By the way, generally the so-called PS plate is conventionally known as a plate used for printing. This makes anodic oxidation aluminum the non-streak section of a hydrophilic property, and has the hydrophobic streak section which was made to harden a photopolymer and was formed on the front face. Printing is performed when the ink adhering to the streak section of the above-mentioned hydrophobic property transfers on space. But this PS plate cannot respond to the above-mentioned presswork digitization.

[0004] On the other hand, corresponding to digitization of presswork besides the above-mentioned PS plate, the method of making production of a version easy is also proposed. For example, by writing in laser absorption layers, such as carbon black, on a PET film, and writing in a streak in what applied the silicon resin layer on it further by the laser beam, a laser absorption layer is made to generate heat and the method of burning a silicon resin layer off with the heat, and producing a version is learned.

Moreover, how to burn off like the above the hydrophilic layer which applied the laser absorption layer of lipophilic property on the aluminum version, and was further applied on it by the laser beam, and use as a version etc. is learned.

[0005]

[Problem(s) to be Solved by the Invention] However, there were the following problems in the above-mentioned conventional technology. First, in the above-mentioned PS plate, since much time and cost were needed for the production, in printing of a small number of number of copies, it had become the factor of a printing cost rise. Moreover, when printing of one pattern finished and the next printing was performed, the exchange work of a version was needed and the version currently used by old had become a disposal. Furthermore, the PS plate cannot respond to digitization of presswork, as mentioned above. That is, in the PS plate, it was impossible to have realized presswork digitization for being unable to produce a version directly from digital data, but realizing laborsaving and highly minute printing.

[0006] Moreover, although it is possible surely to produce the direct version from digital data, if the thing using the thing or the aluminum version using production of the version corresponding to the above-mentioned digitization, i.e., a PET film, is not exchanged for a new version after printing finishes about one pattern, printing cannot do it. That is, the above-mentioned PS plate and a change are not about the situation from which the version used at once serves as a disposal. That is, the cost concerning

the suitable part printing was to go up. Moreover, it cannot be called desirable situation to make into a disposal the version used at once also from the position of the earth environment protection which came to be advocated suddenly in recent years.

[0007] this invention was made in view of the above-mentioned situation, and the place made into the purpose is to offer the printing machine using the plate for printing and it which can be reused corresponding to digitization of presswork.

[0008]

[Means for Solving the Problem] this invention took the following means, in order to solve the above-mentioned technical problem. That is, the plate for printing according to claim 1 is characterized by having the application layer which consists of a compound which can be disassembled by irradiating the light of the wavelength which has energy higher than the bandgap energy of the aforementioned titanium oxide photocatalyst on the coat layer containing the titanium oxide photocatalyst formed through direct or an interlayer on the surface of a base material, and this coat layer.

[0009] the thing with the portion which indicates a hydrophilic property to be the portion which shows a hydrophobic property by operation of a compound and a titanium oxide photocatalyst for which it is alike, respectively and a field is divided is possible for the front face of this plate for printing In addition, a hydrophilic portion is appeared by irradiating light (generally ultraviolet rays) on a coat layer front face. And it becomes possible to demonstrate the function as a plate for printing by using the non-streak section to which ink does not adhere the portion changed into the hydrophilic property concerned, and the hydrophobic portion which remains as the streak section to which ink adheres. Moreover, when an interlayer is minded between a base material and the aforementioned coat layer, it becomes possible to fully maintain the bond strength of the coat layer concerned.

[0010] Moreover, as for the plate for printing according to claim 2, the aforementioned application layer front face is characterized by showing hydrophobic property at least 50 degrees or more by the contact angle of water in the initial state at the time of version production.

[0011] According to this, in the initial state at the time of version production, it can be said that it is in the state where the whole version surface may serve as the streak section.

[0012] Moreover, by irradiating the aforementioned light on the aforementioned application layer front face, the plate for printing according to claim 3 is characterized by changing this coat layer front face into the hydrophilic front face on which the contact angle of water becomes 10 degrees or less while it makes the aforementioned coat layer front face appear.

[0013] According to this, since the coat layer front face which irradiated the light of wavelength with energy higher than the bandgap energy of a titanium oxide photocatalyst is changed into a hydrophilic front face, it becomes possible [using the portion as the non-streak section]. By the way, in this hydrophilicity-ized processing, it has suggested that an operation as shown below is obtained. That is, operation that disassembly of the aforementioned compound is promoted by the original "catalyst" operation by the aforementioned titanium oxide photocatalyst, and the titanium oxide photocatalyst front face itself are the operations from which it becomes the hydrophilic front face where the contact angle of water becomes 10 degrees or less. Therefore, it will be guessed that the aforementioned hydrophilicity-ized processing can be promptly completed in this case. Moreover, this UV irradiation can be made to be carried out based on the digital data based on the picture which it is going to print, for example, and it can say that it is a thing corresponding to digitization of presswork for the plate for printing by this invention in this case.

[0014] Moreover, the plate for printing according to claim 4 is set to the initial state at the time of version production. When the contact angle of water irradiates the aforementioned light on the aforementioned application layer front face which shows hydrophobic property at least 50 degrees or more While making the aforementioned coat layer front face appear in the field to which the light concerned was irradiated, the contact angle of water changes this coat layer front face into a hydrophilic front face 10 degrees or less, and it is characterized by using the non-streak section and the hydrophobic front face which remains for the front face concerned which becomes hydrophilic as the streak section.

[0015] It can say that this is a plate for printing which has the same operation as invention indicated to

the claim 2 and claim 3 which were mentioned above. Therefore, this plate for printing can be called what can respond also to digitization of presswork while it can employ an original operation of titanium oxide light "a catalyst" efficiently in hydrophilicity-ized processing.

[0016] Moreover, the reproduction method of the plate for printing according to claim 5 The coat layer containing the titanium oxide photocatalyst formed through direct or an interlayer on the surface of a base material, It is in the plate for printing equipped with the application layer which consists of a compound which can be disassembled by irradiating the light of the wavelength which has energy higher than the bandgap energy of the aforementioned titanium oxide photocatalyst on this coat layer. The process which cleans the outermost front face including the aforementioned coat layer front face where at least a part shows a hydrophilic property after a printing end and in the field, It is characterized by including at least the process which makes the hydrophobic front face where the account application layer of back to front is re-formed, and the contact angle of water becomes 50 degrees or more appear, and the process which irradiates the aforementioned light on the application layer front face concerned after that further.

[0017] According to this, since a coat layer front face will be changed hydrophobic by applying a compound, the thing as what was indicated to the claim 3 with this same plate for printing, i.e., the plate for printing, can consider that it would be in the initial state at this time. Moreover, this is got blocked and it means that reuse of the plate for printing is possible. Furthermore, since it says that the conversion work to the above-mentioned fact, i.e., a hydrophobic property, is substantially based only on the application work of a compound, it can be said that the work concerned can be completed promptly.

[0018] Moreover, the reproduction method of the plate for printing according to claim 6 is characterized by performing the reproduction method of the plate for printing according to claim 5 on a printing machine.

[0019] It becomes possible to do continuous printing work, without according to this, inserting discontinuation of the printing work considered to follow generally at the time of the work concerning conversion to the aforementioned hydrophobic property, in case it actually prints.

[0020]

[Embodiments of the Invention] Below, the gestalt of operation of this invention is explained with reference to drawing. Drawing 1 shows the cross section also showing the front face of the plate for printing concerning this operation gestalt. In drawing 1, the base material 1 consists of aluminum. In addition, although it can be called very general gestalt to use aluminum as a plate for printing, this invention is not limited to this.

[0021] The interlayer 2 is formed on the base-material 1 front face. As an interlayer 2, silicon system compounds, such as a silica (SiO_2), silicone resin, and silicone rubber, are used as the quality of the material, for example. Among those, especially as silicone resin, silicone alkyd, silicone urethane, silicone epoxy, a silicone acrylic, silicone polyester, etc. are used. It is formed in order that this interlayer 2 may make adhesion with the aforementioned base material 1 and the coat layer 3 mentioned later become a positive thing, and in order to secure adhesion. That is, the bond strength of a result, a base material 1, and the coat layer 3 is to be secured by sticking the coat layer 3 and an interlayer 2 for a base material 1 and an interlayer 2 certainly again, respectively.

[0022] On the interlayer 2, the coat layer 3 containing a titanium oxide photocatalyst is formed. In this coat layer 3 front face, it is possible to make the portion which shows a hydrophobic property to the initial state at the time of version production, and shows a hydrophilic property by irradiating ultraviolet rays appear. This property depends on the property with which the aforementioned titanium oxide photocatalyst is equipped. In addition, suppose about this that it explains in detail later.

[0023] In order to improve the transfer characteristic of the aforementioned property, i.e., a hydrophobic shell hydrophilic property, in this coat layer 3, it is good for it as what added the matter as shown below for the purpose of raising the intensity of the coat layer 3 concerned, and adhesion with a base material 1. The metallic oxide or metal hydroxide which serves as this matter from silica system compounds, such as a silica, a silica sol, an organosilane, and silicon resin, and a zirconium, aluminum, etc., and also a fluorine system resin can be mentioned. In addition, if the strong oxidizing power of a titanium oxide

photocatalyst is taken into consideration, an inorganic compound can call composition of the coat layer 3 a desirable thing from a viewpoint of preventing degradation of the coat layer 3.

[0024] Moreover, although there are the anatase type and rutile type with which the crystal structures differ, respectively as the titanium oxide photocatalyst itself and both can use in this operation gestalt, generally the anatase type with a high photocatalyst operation is more desirable. Moreover, in order to raise the resolution of the picture written in a printing plate and to enable highly minute printing, and in order for forming the coat layer 3 used as thin thickness to also make it possible to store in a visual field, as for the particle size of a titanium oxide photocatalyst, it is desirable that it is 0.1 micrometers or less.

[0025] In addition, if it is marketed and usable things are concretely enumerated in this operation gestalt as a titanium oxide photocatalyst to be used Ishihara Sangyo ST-01, ST-21, workpiece ST-K01 of those, ST-K03, moisture powder type STS-01, STS-02, and STS-21 -- moreover LACTI-01 [Sakai Chemical Industry 25 / SSP-, SSP-20, SSP-M, CSB, CSB-M, and paint type], TAYCA 100 [ATM-], ATM-600, and ST-157 grade can be mentioned. However, even if there is this invention in addition to these titanium oxide photocatalysts, of course, it can apply.

[0026] Moreover, as for the thickness of the coat layer 3, it is desirable that it is within the limits of 0.01-10 micrometers. Because, it is because it becomes difficult to fully employ said property efficiently if thickness is too small, and it will become easy to carry out the cracking crack of the coat layer 3 if thickness is too large, and it becomes the factor of a ****-proof fall. In addition, since this cracking crack is notably observed when thickness exceeds 50 micrometers, though it eases the aforementioned range, it needs to recognize the 50 micrometers concerned as the upper limit. Moreover, it can be said that a general gestalt serves as about 2-3-micrometer thickness in practice.

[0027] Furthermore, what is necessary is to choose suitably the sol applying method, the organic titanate method, a vacuum deposition, etc., and just to form them as the formation method of this coat layer 3. As long as it adopts at this time, for example, the applying method, in the application liquid used for it, you may add a solvent, a cross linking agent, a surfactant, etc. other than various kinds of aforementioned matter which raises the intensity of a titanium oxide photocatalyst and the aforementioned coat layer 3, and adhesion with a base material 1. Moreover, it is more more desirable to act latter one, although an ordinary temperature dryness type or a stoving type is sufficient as application liquid. It is because the direction which raised the intensity of the coat layer 3 by heating becomes advantageous to raising the ****-proof of a version.

[0028] On the coat layer 3, the application layer 4 which consists of a compound which can be disassembled by irradiating the light of wavelength with energy higher than the bandgap energy of a titanium oxide photocatalyst is formed. As shown in drawing 1, as for this application layer 4 front face, the contact angle of water shows hydrophobic property at least 50 degrees or more. Incidentally, if it is made for a contact angle to become 80 degrees or more, it can be said that it is in a more desirable state. In this state, since it has become difficulty, i.e., the state where the so-called water repellence is very high, that water adheres to application layer 4 front face so that guessing also from drawing 1 may be possible, if it says conversely, it can be said that the state with easy the ink for printing adhering on application layer 4 front face is appearing.

[0029] Below, the operation and effect about the plate for printing used as the above-mentioned composition are explained. First, in the initial state at the time of plate production for printing, the coat layer 3 aforementioned front face is adjusted, as are shown in drawing 1, and the contact angle of water shows hydrophobic property at least 50 degrees or more. Carrying out "the initial state at the time of version production" here and "adjusting so that a hydrophobic property may be shown" specifically points out the following **** situations. First, it is carried out by forming the application layer 4 which becomes carrying out "adjusting so that a hydrophobic property may be shown" from the compound which can be disassembled into coat layer 3 front face by UV irradiation, and drying it. In addition, what is necessary is just to adopt suitably methods, such as spray coating, blade coating, deep coating, and roll coating, as this application. Moreover, dryness may be ordinary temperature or a method by any of heating. And the time of coat layer 3 front face becoming hydrophobic by these "adjustment" is pointed out, and it is the thing which is "an initial state at the time of version production" and which carries out a

purport convention.

[0030] having the operation which gives a hydrophobic property to the aforementioned front face as the above-mentioned compound -- of course -- it -- UV irradiation -- " -- easy -- " -- that by which oxidative degradation is carried out is desirable Specifically A ** trimethyl methoxy silane, a trimethyl ethoxy silane, Dimethyl diethoxysilane, methyl trimetoxysilane, a tetramethoxy silane, Methyl triethoxysilane, a tetrapod ethoxy silane, methyl dimethoxysilane, ARUKOKI xylan ** trimethylchlorosilanes, such as octadecyltrimethoxysilane and octadecyl triethoxysilane, A dimethyldichlorosilane, a methyltrichlorosilane, methyl dichlorosilane, Chlorosilicane ** vinyl trichlorosilanes, such as a dimethyl chlorosilicane, Vinyltriethoxysilane, gamma-chloropropyltrimetoxysilane, gamma-chloropropyl methyl dichlorosilane, gamma-chloropropyl methyl dimethoxysilane, Lacan coupling-agent ** hexamethydisilazanes, such as gamma-chloropropyl methyldiethoxysilane and gamma-aminopropyl triethoxysilane, An N and N'-screw (trimethylsilyl) urea, N-trimethylsilyl acetamide, Phloroalkyl silane ** dimethyl hydrogen polysiloxanes, such as silazane ** perphloro alkyl trimethoxysilane, such as dimethyl trimethyl silylamine and diethyl trimethyl silylamine The silicone oil ** lauric acid of a type, a myristic acid, Fatty acids, such as a PAL thymine acid, stearin acid, and oleic acid, etc. are mentioned. However, this invention cannot be overemphasized by that it is not what is restricted only to these compounds. Furthermore, even if it dilutes and uses these compounds with a solvent if needed, it is easy to be natural [compounds].

[0031] In addition, as long as it more generally says "the initial state at the time of version production" as used in the field of above, you may regard it as the time of the start in actual presswork. That is, about a certain given arbitrary pictures, the data which digitized it are already prepared and it can be regarded as what points out the state when imprinting this on a plate. However, the stage where this digitization data is prepared may be, after performing hydrophilicity-ized processing about coat layer 3 front face mentioned later, and what was described now should not be understood strictly. That is, when defining "the initial state at the time of version production" as "the time of an actual presswork start" as mentioned above, it shall be interpreted in a wide sense.

[0032] Next, UV irradiation as shown in drawing 2 is carried out to application layer 4 front face which will be in the above-mentioned state. Based on the digital data about said picture, this UV irradiation is performed so that it may correspond to the data. In addition, ultraviolet rays here are the light of wavelength with energy higher than the bandgap energy of a titanium oxide photocatalyst. More specifically, they are the ultraviolet rays containing light with a wavelength of 400nm or less.

[0033] By this UV irradiation, as similarly shown in drawing 2, while the coat layer 3 front face appears by the aforementioned compound which constitutes the application layer 4 being disassembled, as the front face concerned shows a hydrophilic property, it is changed. This is based on an operation of a titanium oxide photocatalyst. In addition, since it goes on by the original operation as a titanium oxide light "a catalyst", disassembly of a compound will be completed very promptly. As for the field where the ultraviolet rays in coat layer 3 front face were irradiated by these things, the contact angle of water will be in a state 10 degrees or less. This state serves as a relation exactly contrary to the state on the front face of hydrophobic in the previous application layer 4. That is, although most water will spread on coat layer 3 front face in the shape of a film, the ink for printing becomes impossible [adhering to this front face].

[0034] Incidentally, the titanium oxide photocatalyst is said in general as follows about the hydrophilicity-ized mechanism by UV irradiation. When a titanium oxide photocatalyst becomes unhydrophilic, as shown in the drawing 3 left, oxygen is in the state where the bridge was carried out, in the front face. For this reason, a moisture child will not adhere to a front face and will demonstrate a result hydrophobic property. On the other hand, if ultraviolet rays are irradiated at this, the bridge state of previous oxygen will be dispelled, and as shown in the method of the drawing 3 right, a hydroxyl group will appear on a front face. And this hydroxyl group will adsorb the water which exists on a front face, and a hydrophilic property will be demonstrated. In addition, the gestalt which this hydroxyl group exposed on the front face tends to shift to nature to the original hydrophobic front face, if it is left. That is, the state where the bridge of the oxygen was carried out can say chemically that it is stable.

[0035] If processing to the above is completed, the ink for printing will be applied to the application layer 4 or coat layer 3 hydrophilicity--ization-processed front face. Then, the plate for printing as shown, for example in drawing 4 will be produced. In this drawing, the portion by which hatching was carried out is a portion into which the portion in which the above-mentioned hydrophilicity-ized processing was not made, i.e., a hydrophobic portion, and the application layer 4 remain, therefore the streak section to which the ink for printing adhered is shown, the ink for printing is crawled and the portion of one ground, i.e., a hydrophilic portion, and the coat layer 3 surface portion show the non-streak section by which the adhesion was not made. Thus, when a pattern emerges, this plate for printing will have the operation as a parent version.

[0036] Then, the usual presswork is performed and this is terminated. And to the plate for printing which finished this printing, the application layer 4 which consists of a compound which was again mentioned above is formed. Therefore, the plate for printing will have returned to "the initial state at the time of version production" again in the stage which finished this application. That is, on coat layer 3 front face, the application layer 4 in which adhesion of the ink for printing can adhere to the whole surface will be formed at this time, and the hydrophobic property will be shown, and if UV irradiation is again performed on this front face, it will become possible to produce the new parent version for printing. Speaking directly, the plate for printing in this operation gestalt being what can be used repeatedly, if the reuse puts in another way.

[0037] The graph shown in drawing 5 shows collectively what was explained above. It is the graph with which this took time along the horizontal axis and took the contact angle of water along the vertical axis, and it is shown about the plate for printing in this operation gestalt how the contact angle (namely, a canal, a hydrophilic state) of the water of the front face changes with time. in addition, this drawing -- a titanium oxide photocatalyst -- the performance applied hydrophobic if independent -- not being enough (the contact angle of the water before UV irradiation not becoming 50 degrees or more) -- since hydrophobic, it is what showed the case where the titanium oxide photocatalyst equipped with the capacity which conversion to a hydrophilic property completes promptly was used

[0038] According to this, as the coat layer 3 original front face was described above first, the contact angle of water is 20-30 degrees, and hydrophobic ability is not enough. Therefore, it is inadequate for using as the streak section with this, and this cannot be used as a plate for printing. However, this titanium oxide photocatalyst is equipped with the capacity promptly changed into a hydrophilic front face if ultraviolet rays are irradiated as shown in drawing. If it is in usual, although it is common that about 10 mins start as for this conversion, it turns out that it is completed by 1-2min in this example.

[0039] Next, the hydrophobic property of a plate will be in sufficient state as [show / in the curve A in drawing 5] by applying a compound to coat layer 3 front face, namely, forming the application layer 4 in it. Namely, it will be in the state which adhesion of ink is attained and can present use of printing. Moreover, this is got blocked and it is "an initial state at the time of version production" (drawing 5 middle point B). In addition, since it is good only by applying a compound substantially as described above in order to appear this "initial state at the time of version production", it is clear that this can be extremely completed to the inside of a short time.

[0040] Then, while performing UV irradiation and disassembling the aforementioned compound, a part of coat layer 3 front face [at least] is changed as a hydrophilic portion. In addition, since hydrophobic, as shown in the curve C in drawing 5 , the thing [in / this titanium oxide photocatalyst / by both operations of that the conversion rate to a hydrophilic property uses the above large titanium oxide photocatalysts in this case since hydrophobic, and completing / as disassembly of a compound stated previously / promptly /-by original operation of titanium oxide light "catalyst" **] to complete by 1-2min is possible for the conversion to a hydrophilic property.

[0041] The plate for printing to which the above-mentioned processing was performed will adhere to the ink for printing, and actual printing will be performed as shown in the straight line D in drawing 5 . Hereafter, after printing is completed, to the plate for printing, processing of the application of a compound, UV irradiation, etc. will be performed like the above, and reuse will be presented with it.

[0042] As stated now, the plate for printing in this operation gestalt is equipped also with the advantage

which can quicken the cycle with last thing also for the advantage of being reusable. That is, according to the above, the work for realizing them is not to take time anyway also by giving a hydrophilic property also giving a hydrophobic property. Therefore, it is what has possible completing the whole presswork very promptly.

[0043] Below, the invention-in-this-application persons concerning production and printing of the plate for printing check and depend, and explain a concrete example. first, the base material made from aluminum whose thickness the area is postcard size and is 0.3mm -- preparing -- this -- the Sakai Chemical Industry make -- primer LAC PR-01 were applied and dried The thickness of the primer after dryness was 1.4 micrometers. In addition, with this primer layer, it will correspond to the interlayer 2 in drawing 1 . Then, applied titanium oxide photocatalyst coating agent ST-K03 of the Ishihara Sangyo nature, it was made to dry at 150 degrees C, and the coat layer 3 with a thickness of 0.8 micrometers was formed. Furthermore, what diluted Toshiba Silicone octadecyltrimethoxysilane (tradename TSL 8185) with ethanol to 3wt% concentration to this coat layer 3 front face, agitated slowly for 5 minutes, added [as opposed to / this solution / further] 2000 ppm of acetic acids, agitated slowly for 5 minutes again, and was used as hydrophobing processing liquid was applied by roll coating. And this was dried at 120 degrees C and the "initial state at the time of version production" explained several times by the above was made to appear.

[0044] About the plate which applied the above-mentioned hydrophobing processing liquid (namely, octadecyltrimethoxysilane) It masks mostly in paper with the black square on the front face of a plate whose one side is 2cm about a center section. Immediately after carrying out irradiation of the ultraviolet rays of illuminance 40 mW/cm² "for 2 minutes", when the contact angle of water was measured using the CA-W type contact angle meter made from consonance surface chemistry about the UV irradiation portion into the portion which is not masked, the contact angle became "0-2 degrees", and showed hydrophilic property sufficient as the non-streak section.

[0045] This plate was attached in the SAN OFF-SET 220E DX type card printing machine made from SAN PRINTING MACHINRS, and it printed by 2500 print speeds/o'clock on eye best paper using the Toyo Ink ink HYECOO B red MZ and the Mitsubishi Heavy Industries dampening water RISOFERO 1% solution. Consequently, one side which ink does not adhere to the printing plate of the portion which irradiated ultraviolet rays, but is equivalent to the masked plate portion has printed on space the red picture of the square which is 2cm.

[0046] moreover, this -- then, what applied hydrophobing processing liquid by the same method, was made to dry this, carried out circular black masking whose diameter is 2cm to having mentioned above in the plate surface center section further to the above-mentioned plate for printing which ended printing, and irradiated the ultraviolet rays of illuminance 40 mW/cm² for 2 minutes was made as an experiment It becomes the processing carried out in case reuse of this, i.e., the plate for printing, is aimed at. The diameter equivalent to the plate portion masked also in actual printing also by this while the contact angle of the water in a UV irradiation portion became 0-2 degrees and hydrophilic property sufficient as the non-streak section was shown was able to print on space the circular red picture which is 2cm.

[0047] Next, where a version is attached in a card printing machine, after wiping off the ink and dampening water which adhered on the printing plate and applying the aforementioned hydrophobing processing liquid by roll coating, it was made to dry by 120-degree C hot blast, and hydrophobing of the plate front face was carried out. Mostly, it masked in paper with the black equilateral triangle of this version that carried out hydrophobing processing whose one side is 2cm about a center section, and the ultraviolet rays of illuminance 40 mW/cm² were irradiated for 10 minutes at the portion which is not masked. When printed the same with having mentioned this plate above, the red picture of the equilateral triangle whose one side which ink does not adhere to the printing plate of the portion which irradiated ultraviolet rays, but is equivalent to the masked plate portion is 2cm has printed on space.

[0048] In addition, the above-mentioned printing was performed using the printing machine 10 as shown in drawing 6 . That is, this printing machine 10 is what equipped the circumference with coating equipment 12, the Blanc drum 13, version cleaning equipment 14, write-in equipment 15, the inking

roller 16, and the dryer 17 focusing on the version drum 11. The plate for printing is twisted around the version drum 11, and is installed.

[0049] In this printing machine 10, the actual process which presents reuse with the version which ended printing as described above is performed as follows. First, version cleaning equipment 14 is made into the state where it touched to the version drum 11, and the ink and dampening water which adhered on the outermost front face of a plate, i.e., a printing plate, are wiped off. Then, version cleaning equipment 14 is made to secede from the version drum 11, and coating equipment 12 is made into the state where the version drum 11 was touched. The aforementioned hydrophobing processing liquid is applied on the plate by this. Then, coating equipment 12 is made to secede from the version drum 11, a dryer 17 is worked, and hydrophobing processing liquid is dried. Next, based on the digital data of the picture prepared beforehand, a picture is written in the plate front face by which hydrophobing was carried out by the ultraviolet rays which write-in equipment 15 emits. If the above process is completed, the inking roller 16 and the Blanc drum 13 will be made into the state of touching to the version drum 11. And continuous printing is performed by flowing in the direction of the arrow shown in drawing 6 so that paper 18 may touch the Blanc drum 13.

[0050] As explained above, the plate for printing in this operation gestalt can enable the reuse the property which a titanium oxide photocatalyst has, i.e., by using the conversion property to a hydrophilic property, since hydrophobic, and can decrease remarkably the amount of the plate discarded after use. Therefore, the cost in connection with the part and a plate can be reduced sharply. Moreover, since the picture writing from the digital data concerning a picture to a plate can be directly carried out by light (ultraviolet rays), digitization correspondence of presswork has accomplished it and it can plan large time shortening for the suitability, and cost reduction.

[0051] Moreover, as the top also described, the application layer 4 which consists of a compound will be formed, and, in the case of this operation gestalt which aims at reuse for the plate for printing, speeding up of the whole presswork can be attained. The fact which disassembly of the compound concerned is promoted by original operation of titanium oxide light "a catalyst", and completes promptly contributes to this greatly. Furthermore, since hydrophobic, if the conversion rate to a hydrophilic property uses a large titanium oxide photocatalyst primarily, it will contribute to still much more speeding up greatly.

[0052] Furthermore, since it is possible for the processing which aims at reuse of the plate for printing to perform this on a printing machine, speeding up of printing work is realizable. In addition, in the above-mentioned example, since the picture writing to the 4th page of an application layer was also performed on the printing machine, quicker work can be done.

[0053] In addition, in this operation gestalt, although an interlayer 2 is formed between a base material 1 and the coat layer 3, this invention is not limited to this. That is, an interlayer 2 does not necessarily need to prepare. In addition, it can say in this way because the main essence of this invention will be spoiled so that clearly from the upper explanation, though an interlayer 2 is not formed.

[0054]

[Effect of the Invention] As explained above, the plate for printing according to claim 1 can perform conversion to a hydrophobic shell hydrophilic property in the front face by irradiating the light of wavelength with energy higher than the bandgap energy of a titanium oxide photocatalyst by forming an application layer on the coat layer which contains a titanium oxide photocatalyst on the surface of a base material, and this coat layer. Therefore, it becomes possible by using the streak section and a hydrophilic portion for a hydrophobic portion as the non-streak section to demonstrate the function as a plate for printing. In addition, both bond strength can be made enough by preparing an interlayer between a base material and a coat layer at this time. Moreover, the aforementioned compound is matter to which oxidative degradation advances comparatively easily by irradiation of the aforementioned light while being a compound which fitted the aforementioned coat layer as what gives a hydrophobic property. Therefore, the conversion on the above-mentioned hydrophilic front face from a hydrophobic front face can be completed promptly.

[0055] Moreover, it can be said that the plate for printing according to claim 2 is in the state where the whole version surface may serve as the streak section, in the initial state concerned since the contact

angle of water shows [the aforementioned application layer front face] hydrophobic property at least 50 degrees or more in the initial state at the time of version production. Conversely, if UV irradiation which will be imitated in a picture to this application layer front face if it says is performed, it becomes possible to make the picture concerned emerge and this can be used as a parent version.

[0056] Moreover, the plate for printing according to claim 3 becomes possible [using the portion as the non-streak section] by irradiating the aforementioned light on the aforementioned application layer front face. In addition, the aforementioned application layer will be promptly decomposed in response to an original "catalyst" operation of a titanium oxide photocatalyst at the time of this hydrophilicity-ized processing at this time. Therefore, according to this invention, it can be said that it is what can attain speeding up of the production process of the plate for printing, as a result speeding up of presswork. Moreover, it is possible for irradiation of the aforementioned light to be made to be performed based on the digital data based on the picture which is going to carry out the object for printing. Therefore, it can say that the plate for printing by this invention corresponds to digitization of presswork, and, so, large shortening of printing time and cost reduction can be planned.

[0057] Moreover, it can be said that the plate for printing according to claim 4 has a combination-operation of invention indicated to the claim 2 and claim 3 which were mentioned above. Therefore, this plate for printing is what has possible [it is possible to employ an original operation of titanium oxide light "a catalyst" efficiently in hydrophilicity-ized processing, and] while being able to attain speeding up of work corresponding to digitization of presswork, and can plan large shortening and the large cost reduction of printing time like the above.

[0058] Moreover, since the reproduction method of the plate for printing according to claim 5 changes the front face concerned into the aforementioned coat layer front face on which at least a part shows a hydrophilic property in the field hydrophobic by applying a compound, it becomes the thing which can reuse the plate for printing. Therefore, it is not necessary to consider as a disposal with a printing end, and the suitable part cost reduction can be planned like the conventional plate for printing. Moreover, since it says that the conversion work to the above-mentioned fact, i.e., a hydrophobic property, is substantially based only on the application work of a compound, the work concerned can be made to complete promptly.

[0059] Moreover, since the reproduction method of the plate for printing according to claim 6 does the work concerning conversion to the aforementioned hydrophobic property on a printing machine, it does not sandwich discontinuation of the printing work considered to follow generally at the time of the work. Therefore, continuous printing work can be done and speeding up of printing work can be attained. In addition, in this invention, it cannot be overemphasized that the merit concerning reuse of a version is also simultaneously enjoyable.

[Translation done.]